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Can The Upper Limb Tension Test 1 (ULTT1) Stand Alone In Diagnosing Median Nerve Compression In Adult Patients With Carpal Tunnel Syndrome (CTS)?

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Critically Appraised Topic (CAT)

Title: Can The Upper Limb Tension Test 1 (ULTT1) Stand Alone In Diagnosing Median Nerve Compression In Adult Patients with Carpal Tunnel Syndrome (CTS)?

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Date CAT Completed: 10/4/13

Clinical Scenario: Patient presented with shoulder pain, shortened levator scapulae and upper trapezius, radiculopathy in the median nerve distribution, and decreased grip strength. Her orthopedist referred her to PT for carpal tunnel syndrome and disregarded the shoulder pain. I wanted to confirm this diagnosis with testing before starting a treatment plan.

Clinical Question: Is the ULTT1 sensitive and specific in detecting median nerve compression in carpal tunnel patients, and does using the ULTT1 in conjunction with other tests affect the probability of an accurate diagnosis?

Patient/Problem – Carpal Tunnel Syndrome in male and female adults

Intervention – Upper Limb Tension Test #1 for CTS patients

Comparison – None

Outcome – Sensitivity, specificity and post-test probability of median nerve compression detection

Clinical Bottom Line: The study shows that using the ULTT1 increases the probability of true positives by 56.4%, and decreases the probability of false negatives by 40%. By making the ULTT1 more specific to the 1st, 2nd and 3rd digits, those probabilities are improved to 68.4% and 44%. While these numbers are reassuring, the + likelihood ratio (LR) for Wainner's Criterion and the Wainner's with modification was 1.08 and 1.81 respectively, which don't meet the category for even a small increase in post-test probability. Similarly, -LRs are both greater than 0.5, indicating decreased likelihood that the patient does not have CTS.

Based on this I would definitely continue to use the ULTT1 as a diagnostic tool, however it would never stand alone in determining median nerve compression in my opinion. I think the ULTT1 is useful in ruling in CTS, though I feel the rate of false positives is too high and variable, and the sensitivity of the Wainner's with modification is relatively low (0.54). I think because the Wainner's criteria yield a high sensitivity, and the Wainner's with modification yields a high specificity, it might make sense to use the ULTT1 for ruling in CTS if symptoms are limited to the 1st, 2nd and 3rd digits, and using the ULTT1 for ruling out CTS when symptoms are not localized/in a median nerve distribution.

Overall, I do not believe that this study will really increase or decrease my use of the ULTT1 in differential diagnosis for CTS, but will instead change how I use the test. The results of this study support using the ULTT1, so I feel reassured that continuing to use the test utilizes evidence-based practice. Because the study cannot really support the ULTT1 as a stand-alone test for ruling CTS in or out however, I will likely continue to use more than one test/method to diagnose this pathology in future patients. I would have liked to see a more definitive answer,

though with any PT differential you have to utilize a wide range of tests and measures to get the most accurate clinical picture.

Search History:

Databases/Sites Searched	Search Terms	Limits Used
PubMed – Medline	"Carpal Tunnel Syndrome" [Mesh] /"diagnosis" AND ("Upper Extremity [Mesh] OR "upper limb") AND ("tension" OR "neurodynamic") AND "test"	- Past 10 years - Humans - English - Adult: 19+ years

Citations:

Vanti C, Bonfiglioli R, Calabresse M, Marinelli F, Guccione A, Violante FS, Pillastrini P. Upper limb neurodynamic test 1 and symptoms reproduction in carpal tunnel syndrome. A validity study. *Manual Ther.* 2010; Dec(24): 258-263.

Wainner RS, Fritz JM, Irrgang JJ, Delitto A, Allison S, Boninger ML. Development of a clinical prediction rule for the diagnosis of carpal tunnel syndrome. *Archives of Physical and Rehabilitation Medicine* 2005 Apr;86(4):609e18.

Talebi GA, Oskouei AE, Shakori SK. Reliability of upper limb tension test 1 in normal subjects and patients with carpal tunnel syndrome. *J Back Musculoskeletal Rehabil.* 2012;25(3):209-14.

Summary of Study:

Study Design: Validation Study, Clinical Trial & Comparative Study

Setting: School of Physiotherapy and Department of Internal Medicine at the University of Bologna in Bologna, Italy. Health Services Research and Development Service, Washington DC.

Participants: Subjects were all patients at the Clinic of Occupational Medicine at the University of Bologna, and were included in this experiment if they had been referred for suspected CTS and a median nerve conduction study (NCS). Patients were excluded if they had upper extremity joint pathology limiting their ROM, cervical radiculopathy, cognitive deficits, inflammatory or infective or systemic pathology, or history of surgery for CTS. 44 participants were included in the study, of which 33 were female (75%) and 11 were male (25%). The mean age was 46.3, mean BMI was 25.5, and 86% of participants had a symptom duration of more than 3months.

Intervention: History, symptoms, and an NCS were taken beforehand, and Spurling's Test, Neck Distraction Test, cervical ROM goniometry and PROM were assessed to confirm eligibility. The ULTT1 procedure was explained to the patient, and it was ensured that they had not had an NCS within 30 minutes previous to the ULTT1. The test was performed on the unaffected limb first, followed by the affected limb, and followed a series of steps in supine: 1. Shoulder stabilization/depression with the arm at patient's side and the elbow at 90 degrees 2. Shoulder

abduction to 110 degrees 3. Full wrist and finger extension 4. Full supination and shoulder external rotation 5. Full elbow extension 6. Active cervical sidebend contralaterally and ipsilaterally. The ULTT1 was stopped when symptoms were reproduced, and then structural differentiation was conducted; if no symptoms presented then motions were brought to end range. From this final position goniometric measurement was taken for elbow extension, and location and type of symptoms were recorded. Separate professionals took the patient history, performed the NCS, did eligibility tests, and performed the ULTT1, and all were blind to the patient's status besides the test they were conducting. The patient was also unaware of any test findings. The ULTT1 was considered positive per Wainner's criteria¹, and also by Wainner's criteria with the modification that symptoms had to have presented in the 1st, 2nd or 3rd digit only.

Outcome Measures: Considering Wainner's criteria, 39 of the 44 participants tested positive for CTS using ULTT1. Of those 39, 22 had also had positive NCS's for CTS and 17 had negative NCS's for CTS. The remaining 5 participants tested negative for CTS per the ULTT1; 2 of them actually had positive NCS's and 3 had negative NCS's.

Using Wainner's criteria with the modification to only consider symptoms of the 1st, 2nd or 3rd digit, 19 of the 44 participants tested positive for CTS using ULTT1. Of those 19, 13 had also had positive NCS's for CTS and 6 had negative NCS's for CTS. The remaining 25 participants tested negative for CTS per the ULTT1. Of those 25 participants, 11 of them actually had positive NCS's and 14 had negative NCS's.

Data Analysis: From the 2 sets of data collected, sensitivity, specificity and likelihood ratios (LRs) with 95% confidence intervals were calculated. Sensitivity and specificity were calculated via the Wilson Method, and LR's and their 95% confidence intervals were calculated via the Score Method². Post-test probabilities were then calculated by applying the LR to the pre-test probability. Pre-test probability was determined via prevalence of CTS in the sample. It was regarded that a +LR of 2-5 yields a small increase in post-test probability, 5-10 yields a moderate increase, and 10 or more yields a large increase. For -LR values range from 0-1 with smaller values correlating with increased likelihood that the patient does not have CTS.

Summary of Evidence: Using Wainner's criteria, sensitivity for the ULTT1 was 0.9167, and specificity was 0.15. The +LR was 1.0784 with a post-test probability of 56.4% and the -LR was 0.5556 with a post-test probability of 40.0%.

With the addition of further criteria for determining a positive ULTT1 (symptoms being isolated to the 1st, 2nd or 3rd digit), sensitivity for the ULTT1 decreased to 0.5417, however specificity increased to 0.70. The +LR was 1.8056 with a post-test probability of 68.4% and the -LR was 0.6548 with a post-test probability of 44.0%

¹ Wainner's Criteria states that "the ULNT1 was considered positive in presence of at least one of the following: (1) reproduction of patient's symptoms; (2) side-to-side differences ($>10^{\circ}$) in elbow extension on completion of all motion sequences; (3) symptomatic limb side: contralateral neck side-bending increased symptoms or ipsilateral side-bending decreased symptoms." (Wainner et al., 2005).

² +LR = sensitivity/(1-specificity) and -LR = specificity/(1 - sensitivity)

Additional Comments:

- The purpose of this study was not to compare ULTT1 with Wainner's criteria to a ULTT1 with Wainner's criteria with only symptoms of the 1st, 2nd or 3rd digits considered. The purpose of this study was to determine if the ULTT1 was valid and thus a valuable tool in differential diagnosis, with or without modifications to Wainner's criteria.
- Reliability of the ULTT1 has recently (2012) been supported via high intraclass correlation coefficient (relative reliability) and low SEM scores (absolute reliability).
- "The results obtained using the new criterion were similar to those reported in previous diagnostic studies³ on other clinical tests for the diagnosis of CTS, which showed higher specificity than sensitivity" (Vanti et al., 2010)
- The Level of Evidence for this study is 1c as it uses sensitivity and specificity to determine clinical value. This is very useful to me as it will not only help in confirming a diagnosis, but it will help in ruling out conditions as well.
- After reading multiple articles on CTS and the ULTT1, I found this article to be superior in research design, data analysis and overall quality. The procedures were very detailed and controlled, so I felt reassured that care was being taken to avoid error. I also thought that defining what "positive" means for the ULTT1 was great because many therapists will have slightly varying ideas and by having guidelines in place will ensure interrater reliability within this study.
- Some aspects that could have been improved include more equal sample of males and females, larger sample size, and a reliability analysis.
- This CAT was completed as part of Scientific Inquiry II under the instruction of Sally McCormack Tutt PT, DPT, MPH

³ Aroori S, Spence RAJ. Carpal tunnel syndrome. *Ulster Medical Journal* 2008; 77(1):6e17